Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences
Submmit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

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<tr>
<th>Personal information</th>
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<tr>
<td>Name</td>
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<td>Student number</td>
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<th>Studio</th>
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<td>Name / Theme</td>
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**Argumentation of choice of the studio**

The Delta Intervention research group states:” research programme ... investigates the possibilities to combine flood protection and water management strategies with urban design, landscape design and spatial planning, aiming at improving spatial forms and structures in urban and metropolitan delta regions... to make urban delta landscapes more sustainable, attractive and adaptive.” This nearly sums my intention of working with resilient design approach that can preserve the balance between the landscape and urbanized area, and enhance the system when facing the extreme climate change. From this group, I can deepen my understanding of the relation between the landscape and urban area.

Delta area is one of the most dynamic hybrid area (with natural and artificial characteristics and processes). However, one the one hand, the climate change and uncertainty of natural disaster poses the risk on the delta (especially in the transition area between the land and water), on the other hand, the requirements from economic and social development also need to be materialized in the spatial environment. Uncertainty always be there on the two sides, to make full use of extreme situation and scenarios and to customize flexible and resilient design is the aim of this possible thesis.
**Graduation project**

| Title of the graduation project | Reverse to Reboot Urban landscape infrastructure design in Southend towards flood risk management and new social-economic cohesions. |

**Goal**

| Location: | Southend-on-Sea, Thames Estuary, UK |

The posed problem,

[PROBLEM STATEMENT]

The human-centred, socio-economic oriented development paradigm in during last two centuries had turned Southend-On-Sea into a high-density town, with high degree of soil sealing, and suffered from climate-change related hydrological threats. In the short-term, the extreme heavy rainfall and the insufficient surface-water run-off system exacerbate the pluvial flood risk in Southend. In the long-term, the extreme SLR (1.8m) projection model (Lowe and Gregory, 2005), reveals that tidal flood will be more serious in the next 100 years. It is high time to shift the social-economic urbanization paradigm to sustainable development paradigm.

However, the regional regeneration project, Thames Gateway, aims at transforming Southend into a cultural and economic centre, with adding new infrastructure and large construction projects which means more land will be sealed. The pressure from regional development poses a negative impact on the ecology services, and exacerbates the hydrological threats.

At this crossroad of transformation, the space in Southend is already limited, the upcoming projects even gradually erodes the limited green space for adaptation. It is urgent to reverse the artificial sealed ground into relative porous surface to achieve flood risk management and to create the new social-economic cohesions at the same time.

The old urbanization process in Southend
Research Questions:
How to systematically apply urban landscape infrastructure and urban programmes based on carrying capacity of landscape structure to address hydrological vulnerability and reboot socio-economic cohesion?
**Sub research questions:**

H1: How to systematically design the urban landscape infrastructure as territorial strategy to address hydrological vulnerability?

H2: How to imbed the urban programmes in the network of landscape infrastructure based on carrying capacity to create new socio-economic cohesions?

H3: How to achieve the synergy of territorial urban landscape infrastructure and local urban programmes?

**Operational Questions:**

(1) **Hydrological Issue**

N1: What kind of hydrological hazard is happening or upcoming in Southend-On-Sea?

N2: What are the urgency levels of all kinds of environmental threats in Southend-On-Sea?

N3: What are the characteristics of current rainwater and pluvial flood management and strategies?

N4: How does the current landscape infrastructure perform when facing environmental threats?

(2) **Regeneration in Southend**

R1: What kinds of social-economic development requirements are Southend-On-Sea asked to respond?

R2: What kinds of urban programmes are happening in the Southend?

R3: What are the local demands of urban regeneration process in Southend?

**[Hypothesis]**

In the large scale, the urban landscape infrastructure will be the territorial strategy, as the 'networks - the space of flows';

In relatively smaller scale, as a significant component of urban landscape infrastructure, the urban programmes will be the 'nodes - the space of places';

The synergy of these two systems helps to provide micro climate regulation, flood risk management and new social cohesions, and finally to shift urbanization process into sustainable development paradigm.

**[Objectives of project]**

The general objectives of this project is discuss the possibility of shifting the social-economic oriented urbanization paradigm into sustainable development paradigm; and to explore the multi-scalar...
approach to reverse the artificial sealed ground into relative porous surface. Specifically, it is that:

To provide micro climate regulation and flood risk management by applying urban landscape infrastructure;

To achieve new social cohesions by applying urban programmes based on carrying and performative capacity of the landscape structure.

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<th>Design assignment in which these result.</th>
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<td>This project aims at changing the logic of urbanization, and emphasizing nature comes first. On the one hand, urban landscape infrastructure should be implemented in the region as a territorial strategy. On the other hand, urban projects/programs will be introduced in different areas of the region (upstream, middle stream and downstream) based on the carrying and performative capacity of the landscape structure. The brand-new development paradigm is providing for the micro-climate regulations, flood risk management as well as new social cohesion. The main design assignment is following:</td>
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<td>2. Design of the ‘space of flows’ networks: Urban landscape infrastructural Design in Meso Scale (Southend) as territorial strategy for flood risk management and social cohesions.</td>
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<tr>
<td>3. Design of the ‘space of places’ nodes: Urban regeneration programme design based on carrying capacity for flood risk management and social cohesions.</td>
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The methodology framework diagram above illustrates the research process as well as methodology framework of this project. Each section and unit have their specific method, and responds to specific sub-research questions. The project will start with North Sea as the geographical context, we have group research in this scale. In this part, the sea level rise projection and precipitation projection are analysed by using GIS. Then I will zoom into the Thames Estuary, as macro scale, to define the flood situation, degree of soil sealing and population density distribution, the main method is mapping, policy reading and GIS. Based on the analysis above, I address my motivation and scale definition of the project. This part mainly answers the sub research question N1, N4, R1, R2 and R3.

Still in the macro scale, Thames Estuary, 3x3x3 approach will be used to illustrate the urbanization process of Southend in the context of Thames Estuary, from the policy document and mapping. I define the social-economic pressure and
hydrological threats of Southend in the macro scale context. The green grid project is also explained as opportunities and action. This part will address the whole project field, including problem statement, research question, hypothesis and theoretical framework, which will contribute to answer the sub research question N1, N2, N3, R1, R2, R3. The main method of this part is mapping, 3x3x3 approach, policy reading, and literature review.

Then the project will zoom into the meso scale, Southend. The analysis framework and strategic interventions are the focus of this part. Firstly, the urban growth process will be studied from 3x3x3 analysis and urban growth mapping. Then the hydrological threats in the Southend will be defined based on geological condition, permeability, flood locations, and landscape pattern. The main methods are mapping, GIS, transect drawing, and literature review. The third part is the limits of ecosystem, based on the climate and biodiversity analysis, from map, GIS and policy document. The last branch is to define the social-economic characteristic of Southend by analysing the land use, and regeneration projects from mapping, GIS and policy document. Then, based on the evaluation of Southend, in meso scale, the design of urban landscape infrastructure will be the territorial strategy to guide the more specific design in the next part. This section mainly contributes to the N, R series sub research question as well as H1.

The next part is the design of the nodal system for the social economic cohesions in micro and nano scale, the 3x3x3 approach and spatial analysis are the main methods and evidences, this part contributes to the N, R series sub research question as well as H2.

The last part is the conclusion and reflection of the whole project, which will explore the possibility of extension, that is, how to apply this mode in other city and area.

**Literature and general practical preference**

**Conclusion of Theoretical Framework:**

The logic of urbanization has been shifting since cities should be understood as complex economic, ecological and social systems. The old urbanization paradigm, which is social-economic target oriented, is not valid anymore, considering the upcoming challenge of human and nature development in the context of climate change. Urban ecosystems, as complex systems, should be analyzed through time and across scales to understand the dynamics and patterns in such systems. The theory of urban ecology and landscape ecology specifically elaborates the theoretical tools, like POM model and Land Mosaic model to decode the information in urban ecosystems and understand the interactions and dynamics between the built environment and landscape. In this stage, it also points out that the key of successful design for urban ecosystems is to combine the essential ecological functions and cultural functions through time and across scales. (Ahern, 2007) The concept of urban landscape infrastructure is a practical example to apply design in urban ecosystems to enhance the ecological services and provide
social cohesions at the same time. Besides, the design of urban landscape infrastructure emphasis the ‘space of flows’ and the ‘space of places’, which means the integration of the transport, green, blue landscape infrastructure and urban programmes based on carrying capacity of landscape structure. The practical deployment of urban landscape infrastructure also implies that the single purpose/discipline constructions and projects cannot fit the shifting urbanization logic anymore, a more flexible and interdisciplinary spatial intervention for interrelating systems is increasingly essential in this shift. (Nijhuis and Jauslin, 2015) This concept also brings difficulties and challenges to policy making, since the fixed policy and strategy is doomed to fail in this context of dynamics. It is time for human to embrace the uncertainty and unpredictability, and enjoys the dynamics in such complex urban ecosystem.

List of literature:

Complexity theory


Urban ecology and Landscape ecology


Colding, J. (2011). The role of ecosystem services in contemporary urban planning.


Urban landscape infrastructure and Urban programme based on carrying capacity


Flood risk management study


Others


University of Liverpoor. (2009). North Sea Atlas. MEFPO.

Reflection

Relevance

1. Social Relevance

1.1 Climate Change and Hydrological Hazard

Climate change has become the an increasingly urgent issue during the last several decades, and most of specific climate-change related phenomenon is hydrological issue, like sea level rise and flood. Among then, urban pluvial flooding is one of the principal hazards in modern towns and cities. This type of flooding often leads to major economic losses and devastating social and environmental impacts. Take UK
for example, pluvial flood risk accounts for about 1/3 of flood risk in UK, approximately 2 million people in UK urban areas are exposed to an annual pluvial flood risk of 0.5 percent or greater (‘1-in-200 year’ event), furthermore, there will be another 1.2 million people in urban areas who could be affected by 2050 due to a combination of climate change and population growth. (Houston, 2011) As for the economic impact, in 2014, the overall estimated damages of floods in UK were £1.3 billion, which includes both damages incurred by flooding and water-related erosion. (DEFRA, 2016) To be worse, there is obvious uncertainty about projected changes to rainfall and of course flood hazard, especially for pluvial flood, because it is usually caused by short but very intense precipitation which is difficult to capture in climate models, and these kinds of extreme events will increase and become frequent due to the climate change. The research and design related to the pluvial flood and climate change become more and more urgent. (Houston, 2011) In this context, this project aims at introducing the hybrid infrastructure to enhance the performance before the pluvial flood and also provide a possible preparation for sea level rise. This project will contribute to an interdisciplinary approach incorporating engineering, natural sciences and social sciences, and also help to have a deeper understanding of social venerability to flood risk. Besides, the explorations and conclusions in this project could introduce a combination of avoiding the highest risk locations, better landscape infrastructure, investment and upgrade in drainage systems, flood proof urban planning and design, and innovative surface water management schemes.

1.2 Sustainable Development in High-Density Areas

Limited land has become a common issue in high-density, because the further urban development means the higher degree of soil sealing, than means the depletions of ecology service. Therefore, a compact but sustainable city can be an option. Urbanist must aim to develop land more compactly to create sustainable living environments for the future. On the one hand, the land use mix is important for a compact sustainable city, A King County, Washington, study found that areas with low land use mix generate 14 percent more carbon dioxide per person than do areas with high land use mix. (Miller, 2011) The compact structure also could free some land for protection of limited green space and also maintenance of ecology service. This project will contribute to further understanding and approach for the regeneration in high-density areas, where demand for residential and commercial property is high and where the enhancement of ecology service is urgent.

2. Scientific Relevance

2.1 The motivation of Graduation Studio Choice

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2.2 The Practices of Urban Landscape Infrastructure Theory

From the theoretical framework above, we know that, although the concept of landscape infrastructure has begun to transit the understanding of relation between urban infrastructure and landscape, and also been applying in the planning and design in reality. However, there is still few research and approach to explain and guide how to apply in high-density area where is lack of resource of landscape, especially for though urban areas where is over-constructed and has limited space to structure of landscape infrastructure system in the city. Thus, this project is kind of initial exploration of this academic area. Besides, this project also discusses about the integration of urban landscape infrastructure and urban regeneration programmes based on carrying capacity, which is relative new challenge to explore the systematic approach to reverse the sealed ground into sustainable porous surface with social functions. The extension value of this project is to explore the possibility of applying this systematic approach to other cities and area.

Time planning